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Endowed Associate Professor

Department of Electronic Engineering
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Education

- *Ph.D., Materials Science and Engineering, Massachusetts Institute of Technology, 2012*
Thesis advisor: Lionel C. Kimerling
- *B. Eng., Materials Science and Engineering, Tsinghua University, 2007*

Professional Experiences

- *Endowed Associate Professor, Dept. Electronic Engineering, Tsinghua University, present*
also affiliated with: IDG/McGovern Institute for Brain Research at Tsinghua University
- *Postdoctoral Associate, University of Illinois at Urbana-Champaign, 2012–2015*
Advisor: John A. Rogers

Research Interests

- Non-conventional Optoelectronics for Biomedical Applications
- Optical Neural Interfaces
- Biocompatible and Biodegradable Photonics

Teaching Experience

- Leading Lecturer at Tsinghua
 - 20230313 “Foundation of Solid State Physics”
 - 80230992 “Principles of Micro- and Nanofabrication for Electronic and Photonic Devices”
 - 80231001 “Laboratory of Micro- and Nanofabrication for Electronic and Photonic Devices”
 - 60230072 “Academic Writings and Presentations for Electrical Engineering”
- Worked as a guest lecturer and a teaching assistant for multiple courses at Tsinghua, MIT and UIUC
- Supervised undergraduate and graduate students at MIT, UIUC and Tsinghua

Lecture notes for these courses have been uploaded and received widespread attention:

<https://shengxingstars.github.io/www/teaching.html>

Publications

Peer-Reviewed Journals:

Google Scholar: <https://scholar.google.com/citations?hl=en&user=bS9skH4AAAAJ>

#co-first author, *corresponding author

1. X. Cai#, H. Zhang#, P. Wei#, Q. Liu#, D. Sheng, Z. Li, B. Zhang, G. Tang, W. Zhao, Z. Ye, Z. Xue, Y. Xie, Y. Dai, C. Wang, Y. Wang, X. Fu, L. Yin, H. Peng, H. Ding*, G. Zhao*, **X. Sheng***, “A Wireless Optoelectronic Probe Monitors Tissue Oxygenation in the Deep Brain”, *Nature Photonics* **XX**, XXX (2024) *accepted*.
2. J. Chen, H. Ding*, Y. Li, **X. Sheng***, “Numerical Design of a Micro-LED based Optogenetic Stimulator for Visual Cortical Prosthesis”, *IEEE Journal of Selected Topics in Quantum Electronics* **XX**, XXX (2024).
3. J. Chen, H. Ding*, **X. Sheng***, “Advanced Manufacturing of Microscale Light-Emitting Diodes and Their Use in Displays and Biomedicine”, *Journal of Information Display* **XX**, XXXX (2024) (*Invited*).
4. Y. Huang#, Y. Cui#, H. Deng#, J. Wang, R. Hong, S. Hu, H. Hou, Y. Dong, H. Wang, J. Chen, L. Li, Y. Xie, P. Sun, X. Fu, L. Yin, W. Xiong, S.-H. Shi, M. Luo, S. Wang*, X. Li*, **X. Sheng***, “Bioresorbable Thin-Film Silicon Diodes for the Optoelectronic Excitation and Inhibition of Neural Activities”, *Nature Biomedical Engineering* **7**, 486–498 (2023) (*Front Cover*).
5. H. Wang, J. Tian, Y. Jiang, S. Liu, J. Zheng, N. Li, G. Wang, F. Dong, J. Chen, Y. Xie, Y. Huang, X. Cai, X. Wang, W. Xiong, H. Qi, L. Yin, Y. Wang*, **X. Sheng***, “A 3D Biomimetic Optoelectronic Scaffold Repairs Cranial Defects”, *Science Advances* **9**, abq7750 (2023).
6. H. Ding*, Y. Peng, G. Lv, Y. Xie, J. Chen, Z. Shi, Y. Deng, L. Yin, J. Yang, Y. Wang, **X. Sheng***, “Heterogeneous Integration of Thin-Film Organic and Inorganic Devices for Optical based Bioelectrical and Chemical Sensing”, *IEEE Journal of Selected Topics in Quantum Electronics* **29**, 5200107 (2023) (*Invited*).
7. **X. Sheng***, W. Zhao, L. Li, Y. Huang, H. Ding, “Foundation of Brain-Machine Interfaces: Neurons and Diodes”, *Chinese Journal of Lasers* **50**, 0907301 (2023) (*Invited*) (*Front Cover*).
盛兴*, 赵汶鑫, 李丽珠, 黄云翔, 丁贺, 脑机接口技术的基础研究: 神经元与二极管, 中国激光, **50**, 0907301 (2023).
8. Z. Shi#, X. Gao#, X. Cai, H. Zhao, X. Wang, L. Zhao, L. Yin, H. Ding*, **X. Sheng***, “Fully Implantable and Retrievable Upconversion Waveguides for Photodynamic Therapy in Deep Tissue”, *Advanced Optical Materials* **11**, 2300689 (2023) (*Inside Front Cover*).
9. K. Zhang, W. Zhao, **X. Sheng***, “Ion-Gated Tungsten Oxide Based Electrochemical Transistors with Subthreshold Slopes Approaching the Thermodynamic Limit”, *Applied Physics A* **129**, 728 (2023).
10. S. Liu, Q. Yu, R. Guo, K. Chen, J. Xia, Z. Guo, L. He, Q. Wu, L. Liu, Y. Li, B. Zhang, L. Lu, **X. Sheng**, J. Zhu, L. Zhao, H. Qi, K. Liu*, L. Yin*, “A Biodegradable, Adhesive and Stretchable Hydrogel and Potential Applications for Allergic Rhinitis and Epistaxis”, *Advanced Healthcare Materials* **XX**, XXXX (2023).
11. P. Sun, Y. Guan, C. Yang, H. Hou, S. Liu, B. Yang, X. Li, S. Chen, L. Wang, H. Wang, Y. Huang, **X. Sheng**, J. Peng, W. Xiong, Y. Wang*, L. Yin*, “A Bioresorbable and Conductive Scaffold Integrating Silicon Membranes for Peripheral Nerve Regeneration”, *Advanced Healthcare Materials* **XX**, XXXX (2023).
12. L. Kong, H. Wen, Y. Luo, X. Chen, **X. Sheng**, Y. Liu*, P. Chen*, “Dual-Conductive and Stiffness-Morphing Microneedle Patch Enables Continuous in Planta Monitoring of Electrophysiological Signal and Ion Fluctuation”, *ACS Applied Materials & Interfaces* **15**, 43515–43523 (2023).

13. X. Huang, H. Hou, B. Yu, J. Bai, Y. Guan, L. Wang, K. Chen, X. Wang, P. Sun, Y. Deng, S. Liu, X. Cai, Y. Wang, J. Peng, **X. Sheng**, W. Xiong*, L. Yin*, “Fully Biodegradable and Long-Term Operational Primary Zinc Batteries as Power Sources for Electronic Medicine”, *ACS Nano* **17**, 5727–5739 (2023).
14. Y. Deng, M. Zhao, Y. Ma, S. Liu, M. Liu, B. Shen, R. Li, H. Ding, H. Cheng, **X. Sheng**, W. Fu, Z. Li, M. Zhang, L. Yin*, “A Flexible and Biomimetic Olfactory Synapse with Gasotransmitter-Mediated Plasticity”, *Advanced Functional Materials* **33**, 2214139 (2023) (**Back Cover**).
15. F. Dai, Q. Geng, T. Hua, **X. Sheng**, L. Yin*, “Organic Biodegradable Piezoelectric Materials and Their Potential Applications as Bioelectronics”, *Soft Science* **3**, 7 (2023) (**Invited**).
16. S. Liu, X. Wang, S. Liu, Y. Deng, B. Zhao, H. Wang, **X. Sheng**, L. Zhao, L. Wang*, P. Zhang*, L. Yin*, “Laser-Triggered Degradation of Silicon Circuits by Lithiation and Moisture Uptake for On-Demand Transient Electronics”, *Advanced Engineering Materials* **25**, 2300213 (2023).
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18. Y. Luo, X. Chen*, *et al.*, “Technology Roadmap for Flexible Sensors”, *ACS Nano* **17**, 5211–5295 (2023).
19. L. Li#, L. Lu#, Y. Ren#, G. Tang#, Y. Zhao, X. Cai, Z. Shi, H. Ding, C. Liu, D. Cheng, Y. Xie, H. Wang, X. Fu, L. Yin, M. Luo*, **X. Sheng***, “Colocalized, Bidirectional Optogenetic Modulations in Freely Behaving Mice with a Wireless Dual-Color Optoelectronic Probe”, *Nature Communications* **13**, 839 (2022).
20. X. Cai#, L. Li#, W. Liu, N. Du, Y. Zhao, Y. Han, C. Liu, Y. Yin, X. Fu, D. Sheng, L. Yin, L. Wang, P. Wei*, **X. Sheng***, “A Dual-Channel Optogenetic Stimulator Selectively Modulates Distinct Defensive Behaviors”, *iScience* **25**, 103681 (2022) (**Invited**).
21. H. Ding*, G. Lv, X. Cai, J. Chen, Z. Cheng, Y. Peng, G. Tang, Z. Shi, Y. Xie, X. Fu, L. Yin, J. Yang, Y. Wang, **X. Sheng***, “An Optoelectronic Thermometer based on Microscale Infrared-to-Visible Conversion Devices”, *Light: Science & Applications* **11**, 130 (2022).
22. H. Wang, J. Tian, B. Lu, Y. Xie, P. Sun, L. Yin, Y. Wang, **X. Sheng***, “Degradation Study of Thin-Film Silicon Structures in a Cell Culture Medium”, *Sensors* **22**, 802 (2022) (**Invited**).
23. R. Nazempour#, B. Zhang#, Z. Ye, L. Yin, X. Lv, **X. Sheng***, “Emerging Applications of Optical Fiber-Based Devices for Brain Research”, *Advanced Fiber Materials* **4**, 24–42 (2022) (**Invited Review**).
24. D. Kong, Y. Zhang, D. Cheng, E. Wang, K. Zhang, H. Wang, K. Liu, L. Yin*, **X. Sheng***, “Heteroepitaxy of Large-Area, Monocrystalline Lead Halide Perovskite Films on Gallium Arsenide”, *ACS Applied Materials & Interfaces* **14**, 52508–52515 (2022).
25. D. Kong#, K. Zhang#, J. Tian, L. Yin*, **X. Sheng***, “Biocompatible and Biodegradable Light-Emitting Materials and Devices”, *Advanced Materials Technologies* **7**, 2100006 (2022) (**Invited Review**).
26. Y. Deng, H. Qi, Y. Ma, S. Liu, M. Zhao, Z. Guo, Y. Jie, R. Zheng, J. Jing, K. Chen, H. Ding, G. Lv, K. Zhang, R. Li, H. Cheng, L. Zhao, **X. Sheng**, M. Zhang*, L. Yin*, “A flexible and highly sensitive organic electrochemical transistor-based biosensor for continuous and wireless nitric oxide detection”, *Proceedings of the National Academy of Sciences USA* **119**, e2208060119 (2022).
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- Wang, M. Feng, Q. Sun, Q. Wang, Y. Han, L. Wang, Y. Luo, **X. Sheng***, “Transfer-Printed, Tandem Microscale Light-Emitting Diodes for Full-Color Displays”, *Proceedings of the National Academy of Sciences USA* **118**, e2023436118 (2021).
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 31. Y. Yang, M. Wu, A. Vázquez-Guardado, A. Wegener, J. Grajales-Reyes, Y. Deng, T. Wang, R. Avila, J. Moreno, S. Minkowicz, V. Dumrongprechachan, J. Lee, S. Zhang, A. Legaria, Y. Ma, S. Mehta, D. Franklin, L. Hartman, W. Bai, M. Han, H. Zhao, W. Lu, Y. Yu, **X. Sheng**, A. Banks, X. Yu, Z. Donaldson, R. Gereau, C. Good, Z. Xie*, Y. Huang*, Y. Kozorovitskiy*, J. A Rogers*, “Wireless multilateral devices for optogenetic studies of individual and social behaviors”, *Nature Neuroscience* **24**, 1035–1045 (2021).
 32. C. Liu, Y. Zhao, X. Cai, Y. Xie, T. Wang, D. Cheng, L. Li, R. Li, Y. Deng, H. Ding, G. Lv, G. Zhao, L. Liu, G. Zou, M. Feng, Q. Sun, L. Yin, **X. Sheng***, “A Wireless, Implantable Optoelectrochemical Probe for Optogenetic Stimulation and Dopamine Detection”, *Microsystems & Nanoengineering* **6**, 64 (2020) (*Invited*) (*Front Cover*).
 33. R. Nazempour, Q. Zhang, C. Liu, **X. Sheng***, “Design of Silicon Photonic Structures for Multi-site, Multi-Spectral Optogenetics in the Deep Brain”, *IEEE Photonics Journal* **12**, 4200107 (2020).
 34. D. Kong#, D. Cheng#, X. Wang, K. Zhang, H. Wang, K. Liu, H. Li, **X. Sheng***, L. Yin*, “Solution Processed Lead-free Cesium Titanium Halide Perovskites and Their Structural, Thermal and Optical Characteristics”, *Journal of Materials Chemistry C* **8**, 1591–1597 (2020) (*Inside Front Cover*).
 35. Y. Jiang, W. Qi, Q. Zhang, H. Liu, J. Zhang, N. Du, R. Nazempour, Y. Su, R. Fu, K. Zhang, P. Lyu, F. Dong, L. Yin, **X. Sheng***, Y. Wang*, “Green Light-Based Photobiomodulation with an Implantable and Biodegradable Fiber for Bone Regeneration”, *Small Methods* **4**, 1900879 (2020) (*Back Cover*).
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 41. R. Zhou, M. Feng, J. Wang, Q. Sun*, J. Liu, S. Zhang, M. Ikeda, T. Liu, Z. Huang, **X. Sheng**, H. Yang, “InGaN-based lasers with an inverted ridge waveguide heterogeneously integrated on Si(100)”, *ACS Photonics* **7**, 2636–2642 (2020).
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- Express* **28**, 32124–32131 (2020).
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97. Y. Wang, Z. Li, **X. Sheng**, Z. Zhang*, “Synthesis and optical properties of V₂O₅ nanorods”, *Journal of Chemical Physics* **126**, 164701 (2007).

Book Chapters:

1. H. Ding, **X. Sheng**, “Thin-Film III-V Single Junction and Multijunction Solar Cells and Their Integration onto Heterogeneous Substrates”, in *Inorganic Flexible Optoelectronics: Materials and Applications* ed. by Z. Ma and D. Liu, Wiley-VCH (2019).
2. **X. Sheng**, S. Wang, L. Yin, “Flexible, Stretchable and Biodegradable Thin-Film Silicon Photovoltaics”, in *Advances in Silicon Solar Cells* ed. by S. J. Ikhmayies, Springer-Verlag (2018).
3. L. Yin, **X. Sheng**, “Nonconventional Biosensors Based on Nanomembrane Materials”, in *Nanobiomaterials: Classification, Fabrication and Biomedical Applications* ed. by X. Wang, M. Ramalingam, X. Kong and L. Zhao, Wiley-VCH (2018).
4. **X. Sheng**, *Thin-film Silicon Solar Cells: Photonic Design, Process and Fundamentals*, LAMBERT Academic Publishing (2012).

Patents:

1. 盛兴, 赵钰, 谢杨, 植入式探针、控制电路及控制系统, ZL2021 2 0717664.5
2. 盛兴, 刘长波, 李丽珠, 赵钰, 蔡雪, 谢杨, 王强, 多功能植入式探针及其制备方法, ZL2020 1 0874368.6
3. 盛兴, 丁贺, 史钊, 上转换器件和材料及其制造方法, ZL2017 1 1212171.0
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5. J. A. Rogers, X. Sheng, C. A. Bower, M. Meitl, S. Burroughs, "Printing-based multi-junction, multi-terminal photovoltaic devices", US20150207012 / WO2015109242.
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7. X. Sheng, J. Liu, J. Michel, A. M. Agarwal, L. C. Kimerling, "Pseudo-periodic structure for use in thin film solar cells", US20100307579 / WO2010141145.

Services

Internal at Tsinghua:

- *Panelist in postdoc searching committee*
- *Panelist in graduate admission committee*
- *Panelist in undergraduate admission committee*
- *Panelist in graduate thesis committee*
- *Freshmen Mentor*
- *Supervising undergraduate students supported by the Student Research Training (SRT) program*

External:

- *Society Membership*
 - *Optica Fellow*
 - *IEEE senior member*
 - *SPIE life member*
- *Journal Editor*
 - *Optical Materials Express*, Associate Editor, 2017–2023.
 - *Fundamental Research*, Special issue "Multimodal Technologies for Neural Modulation and Sensing", Lead Editor, 2023.
 - *IEEE Journal of Selected Topics in Quantum Electronics*, Special issue "Flexible Optoelectronics", Guest Editor, 2023.
 - *Frontiers in Nanotechnology*, Feature issue "New Technologies for Large-Scale Recording and Modulation in the Brain", Guest Editor, 2021.
 - *Optical Materials Express*, Feature issue "Bio-inspired and Bio-integrated Photonic Materials and Devices", Lead Editor, 2019.
- *Board Member*
 - *Chinese Association of Automation*
 - *Chinese NeuroScience Society*
 - *Chinese Society of Biomedical Engineering*
- *Conference Organizer for multiple domestic and international conferences*
 - 2023 Optica Advanced Photonics Congress, Solar Energy and Light-Emitting Devices (SOLET)

- Topical Meeting, Busan, Korea. Subcommittee.
 - 2020 CIMTEC 9th Forum on New Materials, Montecatini Terme, Italy. International Advisory Board Member.
 - 2019 IEEE-EMBS 16th International Conference on Wearable and Implantable Body Sensor Networks (BSN), Chicago, IL, USA. Technical Program Committee.
 - 2019 MRS spring meeting, Phoenix, AZ, USA. Symposium Organizer.
 - 2017 OSA IPR meeting, New Orleans, LA, USA. Subcommittee.
 - 2016 MRS fall meeting, Boston, MA, USA. Symposium Organizer.
 - 2016 MRS spring meeting, Phoenix, AZ, USA. Symposium Organizer.
- *Reviewer for multiple international journals*
 - *Proposal Reviewer for NSFC, and multiple international funding agencies*
 - *Co-president, MIT Chinese Association of Science and Technology, 2010.*
 - *Scientific consultant for several high-tech start-up companies.*

Awards and Honors

International

- Rising Stars of Light (Finalists), by Light: Science & Applications, 2023
- Young Scientist Award, Photonics & Electromagnetics Research Symposium (PIERS), 2018
- Young Scientist Award, Microsystems & Nanoengineering Summit (MINE), 2018
- Best Poster Award (2nd prize) in Nature Conference on Flexible Electronics, Nanjing, 2016
- Gordon Engineering Leadership Teaching Assistantship, MIT, 2011
- Energy Initiative Seed Fund Award, MIT, 2010
- Best Poster Award (runner-up) in the 35th IEEE Photovoltaic Specialists Conference, 2010
- Energy Initiative Martin Fellowship, MIT, 2010
- DuPont-MIT Alliance Fellowship, 2007
- MIT Presidential Fellowship, 2007

Domestic (in Chinese)

- 清华大学，电子工程系，郑君里教书育人优秀教师奖，2022
- 清华大学，电子工程系，周炳琨学者奖，2022
- 中国生物医学工程大会，青年优秀论文报告，2022
- 中国材料研究学会，科学技术一等奖（基础研究类），生物可降解材料的性能调控及新型器件研究（编号：211-07），清华大学：尹斓，王秀梅，盛兴，2021
- 《中国激光》主编推荐奖优秀论文，2019
- “中国新锐科技卓越影响奖”，2018
- 青年千人计划，2014
- 清华大学，优良毕业生，2007
- 清华大学，杜邦学生奖学金，2006
- 清华大学，三星学生奖学金，2005

- 清华大学, 伍占德学生奖学金, 2004
- 清华大学, 新生奖学金, 2003